

UNDATED



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION,
PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Transmittal of EFED's RED chapter for triclopyr, triethylamine salt of triclopyr and butoxyethyl ester of triclopyr (Chemical numbers 116001, 116002, and 116004; Case # 2710); DP Barcodes D224274, D224273, D224178, D226661, D160595, D180742, D195391, D200271, and EFED's recommendations for triclopyr, triethylamine salt of triclopyr, and butoxyethyl ester of triclopyr

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THRU: Elizabeth M. Leovey, Chief
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TO: Walt Waldrop, Acting Chief
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Attached is the EFED chapter for the Triclopyr RED (Case # 2710) which contains an integrated EFED risk assessment on triclopyr, the triethylamine salt of triclopyr (triclopyr TEA), and the butoxyethyl ester of triclopyr (triclopyr BEE). The attached product contains a drop-in chapter for both the environmental fate assessment and the ecological risk assessment, as well as an integrated risk characterization. If you have any questions, please contact Mike Davy, task leader at 305-7081.

Triclopyr Use Patterns Addressed in Risk Assessment

Triclopyr is a non-selective herbicide used for control of brush and broadleaf weeds. It is a member of the picolinic acid group whose mode of action is growth regulation. The mode of action is disruption of the phloem (food-conducting tissue) resulting in abnormal growth.

Triclopyr acid is formulated as a manufacturing use product. There are currently no registered uses for triclopyr acid. The

acid is then formulated into two end use products: a butoxyethyl ester (triclopyr BEE); and a triethylamine salt (triclopyr TEA). Each formulation of triclopyr includes an emulsifiable concentrate and a soluble concentrate/liquid. Triclopyr TEA formulations are also labeled for homeowner use as a spot treatment with weed sticks (impregnated material), and granular weed-and-feed formulations ($\leq 2\%$ ai).

Triclopyr BEE and TEA formulations are registered for both air and ground application. They can be used on dormant or actively growing foliage, stems, or trunks. The use sites that the TEA and BEE formulations have in common are: pastures, rangelands, non-agricultural rights-of-way, drainage systems, and various forestry uses. The TEA formulation has a unique use on rice and the BEE formulation on streams/rivers/channeled water. The registered maximum use rates for both the TEA and the BEE formulations range from approximately 1 lb ae/A to 12 lbs ae/A.

Data Requirements

Environmental Fate

Storage stability concerns:

There are three environmental fate studies using triclopyr BEE that are scientifically valid but cannot be used to satisfy their respective data requirements because insufficient freezer storage stability data were available at the time of review (terrestrial field dissipation [GLN 164-1] MRID 42730601; forestry dissipation [GLN 164-3] MRIDs 41445001 and 43011601). The registrant has submitted a summary (DP Barcode D227517; MRIDs 44039301, 44039302, and administrative documents) of information gathered from a number of their studies regarding the storage stability of triclopyr, TCP, and TMP; this information is in review.

A recently-reviewed aquatic field dissipation study conducted on rice in Arkansas and Louisiana (MRID 43955901; DowElanco; DP Barcode 224558) is also scientifically valid but cannot be used to satisfy the Aquatic Field Dissipation data requirement (164-2) for Triclopyr, triethylamine salt (PC # 035302) at this time because insufficient freezer storage stability data were submitted for the methoxyypyridine (TMP) degradate. The study authors submitted preliminary data (up to 30 days frozen storage) and said that the final information would be submitted when available. This study can be upgraded to acceptable if the registrant submits adequate storage stability data for TMP for the maximum period of storage prior to analysis (according to the submission, up to 470 days).

Phenoxy strategy:

Consistent with the phenoxy strategy developed in EFED, data provided for triclopyr acid will be used to satisfy the following data requirements for the triclopyr moiety of the TEA salt: 161-1, -2, -3, 162-1, 162-2/3, 162-4, 163-1. Data provided for triclopyr acid will be used to satisfy the following data requirements for the triclopyr moiety of the BEE ester: 161-3, 162-1, 162-4, 163-1. Because acceptable metabolism studies are available for both the TEA and BEE moieties, no additional information regarding the environmental fate of these moieties is required.

Photodegradation on soil:

The Agency has no acceptable data on photodegradation on soil for either the acid, BEE or TEA. A previously reviewed study using triclopyr acid (MRID 41323501) was unacceptable because of variability in the data and the soil was sterilized before use.

A previously reviewed study using triclopyr BEE (MRIDs 00151966 and 92190012) was unacceptable because there was only one sampling interval (28 days posttreatment); therefore, the application rate could not be confirmed and a degradation half-life could not be calculated. In addition, the artificial light source was not described or compared to natural sunlight, and temperature was not controlled.

Acceptable information on the photodegradation on soil is required for the acid in order to better understand the rate of dissipation of triclopyr on soil surfaces. These results would be useful in estimating the extent of exposure for birds and mammals that feed at the soil surface and can be used to further evaluate chronic risk.

Consistent with the phenoxy strategy developed in EFED (see above), acceptable information on the photodegradation of the acid on soil will fulfill the 161-3 data requirement. No further information on the photodegradation of triclopyr TEA, triclopyr BEE, or the TEA or BEE moieties are required.

Ecological Effects

There are no currently outstanding data requirements for triclopyr acid, triclopyr TEA, and triclopyr BEE.

Data endpoints from the eco-toxicity studies are in pounds active ingredient. Use and exposure data are in pounds acid equivalents. A conversion of active ingredients to acid equivalents was made by using a ratio formula with percentages of the acid equivalent active ingredient obtained from the labels.

Summary of Risks

Risk quotients from the risk assessments are summarized in the attached table.

BIRDS

The currently-labeled use rate for triclopyr TEA granular formulation (0.54 lbs ae/A) is not likely to pose a risk to birds.

Bird species which feed on short grasses are the most susceptible to possible impact (i.e. acute effect) from the use of triclopyr TEA and BEE in liquid formulation above 6.0 lb ae/A. However, since the Kenaga and Hoerger nomograph values are based on zero hour exposure and do not consider any degradative processes, available residues of triclopyr TEA and BEE may be lower than predicted by these values. The foliar persistence and duration of palatability of vegetation treated with triclopyr TEA and BEE is uncertain.

There is potential for triclopyr acid to cause reproductive impairment (i.e. chronic effect) to birds when concentrations greater than 500 ppm are reached. Use of maximum residue levels in the avian risk assessment is a first level screen, because it accounts for any uncertainty in laboratory ecotoxicity data, the lack of residue data on foliage, behavior of bird species in the field, and environmental conditions. This conservative assessment provides safety factors for bird species not accurately represented by the test surrogate species. Although the persistence of triclopyr acid/anion on avian food items is unknown, it is possible that environmental concentrations will remain high enough for sufficient duration to produce chronic effect(s).

MAMMALS

Mammal species that feed on short grasses (such as meadow voles) are the most susceptible to possible impact (i.e. acute effect) from the use of triclopyr TEA and BEE above 1.0 lb ae/A. However, since the Kenaga and Hoerger nomograph values are based on zero hour exposure and do not consider any degradative processes, available residues of triclopyr TEA and BEE may be lower than predicted by these values. The foliar persistence and duration of palatability of vegetation treated with triclopyr TEA and BEE is uncertain.

The chronic risk assessment for mammals is based solely on the laboratory rat. Because other types of mammals consume a

greater proportion of their body weight per day, the resultant ingestion of greater quantities of triclopyr may result in greater risk to these mammals. Although the persistence of triclopyr acid/anion on mammalian food items is unknown, it is possible that environmental concentrations will remain high enough for sufficient duration to produce chronic effect(s). As previously mentioned, the soil photodegradation study may help in assessing persistence in media other than water.

INSECTS

All forms of triclopyr are practically non-toxic to bees. Therefore, it is not expected that insects will be adversely affected by the use of triclopyr.

AQUATIC ANIMALS

There are no concerns for acute or chronic risks to aquatic organisms from the use of triclopyr TEA or triclopyr acid. Acute risk to fish and mollusks is probable from direct application of the triclopyr BEE form to shallow aquatic habitats; however, fate data suggests that exposure will be transitory. Chronic risk from triclopyr BEE is not expected because of its short duration under environmental conditions (e.g. rapid photodegradation and hydrolysis in aquatic systems).

TERRESTRIAL PLANTS

Triclopyr TEA and BEE pose a greater risk from aerial application than the runoff that occurs from ground application. There is risk to non-target plants at all use rates for both triclopyr TEA and triclopyr BEE.

AQUATIC PLANTS

Only direct application of triclopyr TEA at ≥ 9 lbs ae/A to shallow water results in risk of concern to aquatic vascular plants and for algae/diatoms. Triclopyr BEE may pose a significant risk to algae/diatoms and vascular plants when applied directly into water from use sites such as forestry, drainage systems, and streams/rivers/channelized water.

ENDANGERED SPECIES

Endangered species of birds, mammals, aquatic plants and terrestrial plants may be affected by the use of triclopyr TEA.

Endangered species of birds, mammals, fish, aquatic invertebrates, estuarine species, aquatic plants and terrestrial plants may be affected by the use of triclopyr BEE.

Water Resources

Groundwater Label Advisory

A ground water label advisory is used for pesticides and their degradates that are mobile and persistent in the environment and have the potential to leach to ground water. The advisory informs the user and the public that under some conditions, use may result in leaching to ground water. The low K_d and K_{oc} values indicate that the degrade TCP will not strongly bind to soil organic matter and is relatively mobile. TCP is somewhat persistent ($t_{1/2} > 1$ year under laboratory conditions [aerobic soil metabolism] and $t_{1/2} > 3$ weeks under field conditions [field dissipation]). The depth to which TCP was detected in the California field dissipation study (up to 76 cm) suggests the potential to leach to ground water under some conditions. Pesticides and degradates with similar properties have been found in ground water. EFED continues to recommend a ground water label advisory. EFED recommends a label advisory for both triclopyr BEE and triclopyr TEA. Triclopyr BEE has a low potential to contaminate ground water, however, both triclopyr BEE and triclopyr TEA may produce the degrade TCP, which is relatively mobile and persistent, and has the potential to contaminate groundwater. The following label language is appropriate:

"This chemical has properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground-water contamination."

Surface Water

Triclopyr acid is not predicted to persist in surface waters because of the rapid photolytic degradation in aquatic environments. Flowing water systems (such as forested watersheds) would result in rapid dissipation of triclopyr BEE to triclopyr acid.

Overview of Triclopyr Risk

Triclopyr TEA

There are no risks to fish, aquatic invertebrates, estuarine/marine species, birds or mammals from the currently labeled (0.54 lb ae/A) granular formulation of triclopyr TEA.

There exists a high potential for acute risk to birds and mammals from the use of triclopyr TEA at high application rates.

There is potential for chronic risk to some birds and mammals from triclopyr TEA, but this conclusion is uncertain due to the lack of data on the rate of dissipation of triclopyr on food items.

There are no acute or chronic risks to fish, aquatic invertebrates, or estuarine/marine species from the use of triclopyr TEA.

There is a high potential for acute risk to non-target plants from triclopyr TEA.

Criteria for restricted use is exceeded for birds and mammals from the use of triclopyr TEA.

Endangered species of birds, mammals, and plants may be affected by triclopyr TEA.

Triclopyr BEE

There are no risks to fish, aquatic invertebrates, estuarine/marine species, birds or mammals from the currently labeled (0.54 lb ae/A) granular formulation of triclopyr BEE.

There is a high potential for acute risk to birds and mammals from triclopyr BEE.

There is a potential for chronic risk to birds and mammals from triclopyr BEE, but this conclusion is uncertain due to the lack of data on the rate of dissipation of triclopyr on food items.

There is a high potential for transitory acute risk to fish, aquatic invertebrates and estuarine/marine species from triclopyr BEE.

There are no chronic risks to fish, aquatic invertebrates, or estuarine/marine species from the use of triclopyr BEE.

There is a high potential for acute risk to non-target plants from triclopyr BEE.

Criteria for restricted use is exceeded for birds, mammals, fish, aquatic invertebrates, and estuarine/marine species from the use of triclopyr BEE.

Endangered species of birds, mammals, fish, aquatic invertebrates, estuarine/marine species, and plants may be

affected by triclopyr BEE.

Water Resources

There is potential for the major soil degradate of triclopyr, trichloropyridinol (TCP) to leach to groundwater from triclopyr TEA or BEE.

Triclopyr acid is not predicted to persist in surface waters.

Please see attached table of **Range of Risk Quotients Among Various Organisms That May Be Affected From Use of Triclopyr TEA and BEE.**

RISK REDUCTION RECOMMENDATIONS

1. Reduction of the application rates would reduce risk. Below are risk reduction rationale for eliminating or reducing the rates of application:

- a. Eliminating the 12 lb ae/A and the 8 or 9 lb ae/A rates

- would eliminate high acute risk LOC exceedances for birds and mammals for the BEE formulation.
- would eliminate LOC exceedances for high acute risk to fish whenever triclopyr BEE is applied to pastures, rangeland, non-agricultural rights-of ways, fencerows, hedgerows, or non-agricultural uncultivated areas/soils.
- would eliminate high acute risk to freshwater and estuarine/marine invertebrates whenever triclopyr BEE is applied to forestry, drainage systems, or stream/rivers/channeled water sites.
- would eliminate acute risk to non-target terrestrial and aquatic plants whenever triclopyr BEE is applied to pastures, rangeland, non-agricultural rights-of ways, fencerows, hedgerows, or non-agricultural uncultivated areas/soils. Risk to non-target plants would be reduced when triclopyr BEE is used for forestry, drainage systems or stream/rivers/channeled water sites.

- b. Elimination of only the 12 lb ae/A rate

- will only eliminate the LOC exceedance for high acute risk to birds and mammals from the BEE formulation.

2. Elimination of aerial application from the BEE or TEA formulation would result in:
 - significant reduction of risk to non-target terrestrial plants in that fewer non-target plant species will be exposed. There appears to be a greater reduction of risk to non-target plants from elimination of the BEE triclopyr use than from the TEA triclopyr due to the higher phytotoxicity of the triclopyr BEE.
3. Elimination of use sites for triclopyr BEE where triclopyr TEA could be used instead, would do the following:
 - eliminate of high acute risk to aquatic animals including endangered species.
 - reduce acute risk to non-target plants.
4. Risk to non-target plants probably occurs when there is heavy rain immediately following application. An advisory statement such as the following may reduce this risk:

"Avoid application when heavy rainfall (>0.5 inch) is expected to occur within 48 hours".
5. Standard spray drift labeling should be required if aerial application is permitted. This would reduce risk to non-target organisms by limiting the amount of spray drift from triclopyr TEA or BEE.

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CHEMICAL INFORMATION:

Common Name: Triclopyr Triclopyr TEA Triclopyr BEE

CAS No.: 55355-06-3 57213-69-1
64700-56-7

PC Code No.: 116001 116002 116004

Chemical Name: 3,5,6-Trichloro-2-pyridinyoxyacetic acid
(known as Triclopyr), its triethylamine salt
(known as Triclopyr TEA), and its butoxyethyl
ester (known as Triclopyr BEE).

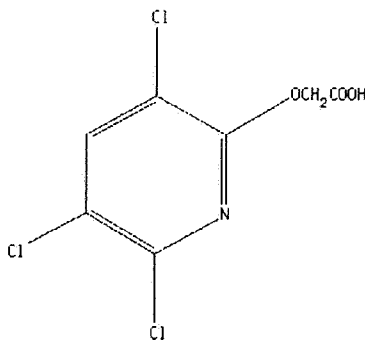
Trade Names: (from LUIS report dated February 29, 1996)

TEA salt: Garlon 3A, Brush-B-Gon, Hammer, Grandstand R,
Turflon Amine.

BEE ester: Garlon 4, Remedy, Grazon ET, Exetor,
Pathfinder II, DowElanco Basal, Turflon
Ester. [BEE technical = 69% ae; 62719-87]

Triclopyr acid: Not currently registered in any end-use
products; for manufacturing/formulation
use only.

Chemical Structure:



Triclopyr acid

Formulations: Triclopyr TEA and BEE are formulated as emulsifiable concentrate, soluble concentrated liquid or liquid-ready-to-use. Formulations unique to triclopyr TEA are impregnated material formulations (weed sticks) and granular formulations (home lawn care).

Physical/Chemical Properties of Active Ingredient:

A. Triclopyr:

Molecular Formula: $C_7H_4Cl_3NO_3$
Molecular Weight: 256.46 g/mol
Physical State: Fluffy, colorless solid
Melting Point: 148-150°C
Solubility (25°C): 440 mg/L water;
989 g/kg acetone;
27.3 g/kg chloroform;
410 mg/kg hexane
307 g/kg octan-1-ol
Vapor Pressure (25°C): 1.26×10^{-6} mm Hg
Log K_{ow} : -0.69
 K_{ow} : 0.204

B. Triclopyr TEA:

Molecular Formula: $C_{13}H_{19}Cl_3N_2O_3$
Molecular Weight: 358.67 g/mol
Log K_{ow} : -0.510

[following info from 40564903:

Physical state: pink/purple liquid @ 20 °C.

Odor: Ammonia-like

Solubility in water (25°C): pH 5: 1.2 wt %
pH 7: 41.2 wt %
pH 9: 27.8 wt %

Octanol/water partition coefficient: 0.309 at pH 7 from
0.01 M solution

[following info from 42650402:

Physical state: Grayish white, odorless granular solid

Solubility in water (20°C): >50% by weight

Melting point: 111-117°C

C. Triclopyr BEE:

Molecular Formula: $C_{13}H_{16}Cl_3NO_4$
Molecular Weight: 356.63 g/mol
Solubility in Water (25°C): 7.4 ppm

[following info from 40557003:

Physical state: Amber liquid @ 20 °C.

Odor: Sweet, alcohol-like

Solubility in water (25°C): 6.8 ppm

Vapor pressure (25 °C): 3.6×10^{-6} mm Hg

[from 42090420:

Log K_{ow} : 4.49 (K_{ow} = 30903)

D. Triethylamine hydrochloride:

Melting point: 260°C

pKa (TEA-H⁺/TEA): >10

Vapor pressure (TEA): 51.8 mm Hg @ 20°C

E. 2-Butoxyethanol (ethylene glycol monobutyl ether):

[data from Condensed Chemical Dictionary, 10th edition, 1981]:

physical state: Colorless liquid.

boiling point: 171.2°C

specific gravity: 0.9019 (20/20°C)

vapor pressure: 0.76 mm Hg @ 20°C

(info from Aldrich Chemical Catalog)

Molecular wt.: 118.18 g/mol

Boiling point: 171°C at 743 mm

Density: 0.903 g/mL at 20°C

Vapor pressure: 0.6 mm at 20°C

BACKGROUND:

Triclopyr is a systemic herbicide used for the control of woody plants and broadleaf weeds on rights-of-way, forests, industrial sites, fencerows, and lawns. The triclopyr acid is used as a manufacturing product only. The maximum label application rate for triclopyr BEE is 12 lb ae/A; the maximum label application rate for triclopyr TEA is 12.12 lb ae/A.

The registered use patterns are as follows (LUIS report dated February 29, 1996):

<u>Use pattern</u>	<u>Ester</u>	<u>Salt</u>
Terrestrial food+feed crop	---	X
Terrestrial feed crop	X	X
Terrestrial non-food crop	X	X
Aquatic food crop	---	X
Aquatic non-food	X	X
Forestry X	X	X
Outdoor residential	---	X
Indoor food	X	---

TEA salt can be formulated with picloram, isooctyl ester (Access); 2,4-D, dimethylamine salt (Turflon II Amine); and clorpyralid, triethylamine salt (Confront F).

BEE ester can be formulated with 2,4-D, butoxyethyl ester (Turflon D, Turflon Ester F, Crossbow).